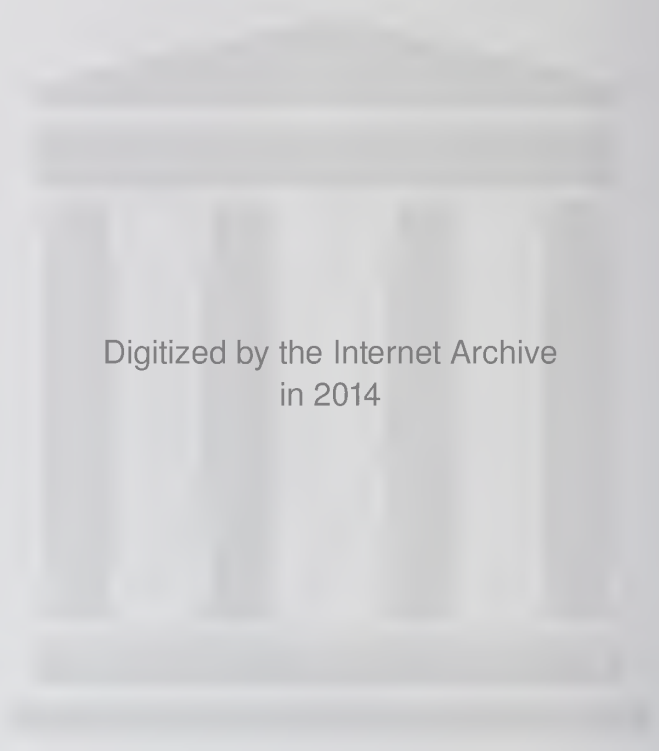




Digitized by the Internet Archive
in 2014

The Best

Water Electric Light and Power System

FOR

San Francisco

AND

The Bay Cities

FROM

The American River

NEAR AUBURN

with

Appendix

Compared with *Hetch Hetchy*

BY

JAY E. RUSSELL

OF THE SAN FRANCISCO BAR

1907-8



The Best
Water Electric Light
and Power System

FOR

San Francisco

AND

The Bay Cities

FROM

The American River

NEAR AUBURN

BY

JAY E. RUSSELL
OF THE SAN FRANCISCO BAR

1907-8



THE BEST WATER, ELECTRIC LIGHT AND POWER SYSTEMS FOR SAN FRANCISCO AND THE BAY CITIES

PREFACE

I have written this little book, because I am desirous that the public should know where and how the chief public utilities can be obtained, all from the same source, for the residents of the Bay Cities, at the cost of production, without graft or special favoritism.

Having taken a trip around the globe and examined various sources of water supplies, and the methods of utilizing the great necessities in distant cities, and having had the practical experience in harnessing, owning, and operating two water powers in the East, with considerable litigation, and having been engaged more or less during the past thirty years examining the water properties in this State within a circle of 200 miles from the Bay, I feel competent to advise how the public can be properly served with the best mountain water, electric light, and power at the lowest cost of production.

The best water system for San Francisco and the Bay Cities is one with a daily capacity of not less than 60,000,000 gallons conveying water with the highest head or pressure without pumping to the confines of the City and County in two or more pipes with electric power at the same source, sufficient to do any necessary pumping, light the Cities, and sell sufficient surplus to pay the interest on the bonds that may be issued in payment of the construction works. The source of supply must be in the Sierra Nevada Mountains at a high altitude, where solitude reigns supreme, away from human habitations, where the snow and rainfall is heavy, the snow melting all the year, producing soft water, free from animal or vegetable matter, and the water, too, when it has reached the lower reservoirs will not green over, even when exposed all summer to the sun's hottest rays. No filtering, no aerating, but pure as it exists anywhere in nature.

INADEQUACY OF THE PRESENT SYSTEMS TO MEET THE DEMANDS OF THE PUBLIC

All the water now obtained within a circle of 30 miles from San Francisco is unsuitable for domestic use for these reasons.

- 1 The average annual rainfall is about 20 inches with no water obtained from melted snow.
- 2 All the soil within that circle carries more or less alkali, a substance which like potash has an affinity for flesh, and when taken in large quantities is a deadly poison. For proof of the existence of alkali in the Spring Valley water, we need only to look at the leaky kitchen range boilers, which, after being used a few months, the galvanized iron is corroded through from the inside by the effect of the alkali in the water. No amount of boiling the water will remove this chemical substance but only make the product stronger.
- 3 All the water which we now are forced to use is hard, unsuitable for washing purposes; although it is filtered and aerated it does not become soft like snow water.

Frequently barrels of lime are thrown into the reservoirs to remove the swampy taste and smell.

Artesian water in this country is hard. The Cities should own and control their own utilities, notwithstanding the change may hurt some soulless corporation; corporations like individuals must enter the business arena subject to all the losses and gains common to every business enterprise. The doctrine of "The survival of the fittest" must prevail with corporations as well as individuals. The slogan in republics is "The greatest good for the greatest number."

We must have a better water system than either the Spring Valley or the People's Water Company can procure. The heaviest tax that Oakland residents have is the water tax. A family containing only two persons is compelled to pay \$18.00 annually for drinking and washing purposes. The cost of the flour for such a family would not exceed half that amount.

The People's Water Company admit that they collected \$1,111,000.00 from water rates during the year 1906; this is 5 per cent interest on \$22,220,000, while the actual cost of the water works did not exceed \$5,000,000.

The clearness of the water of Lake Tahoe is well known, but it is no better in quality than the head waters of the American River. The average annual rainfall on the Lake is less than one-half of the annual precipitation on the southeastern slope of the Sierras five miles away, where the average annual rainfall is more than 100 inches, the maximum rainfall in the State of California.

Of all the sources of supply which the cities have to select from, the North and Middle Forks at their conjunction with the main American River, near Auburn, are together the best, carrying double the amount of water of any single fork of the River, and controlling all the proposed water schemes above, on the same watercourse. The Tuolumne supply has dropped out overboard. "The Feather River is too far north. The Yuba River is not pure, and the Mokelumne is all appropriated by the Standard Electric Co."

"Every Sierra water system involves collection of water in winter and spring into large reservoirs which will hold a sufficient supply to carry over the low river stages of summer and autumn. Nearly every river of the Sierras that is considered available has its entire water supply appropriated at their low water flow, while every reservoir capable of being constructed on the flanks of the Sierras could not hold the flood water that escapes into the ocean in the early spring and summer, so that there is a plenty of the best water to be had, and the United States Government surveys show that there are plenty of reservoir sites. It is a mere question of choosing the best, and among the equally good supplies the cheapest is the best."

The American River as a source of supply has been commended by Von Schmidt and by Mendell, as well as numerous other engineers. Conclusive evidence received from many independent sources proves that the North and Middle Forks, at their junction, have perfect facilities to *give the Cities water enough*. A large, deep reservoir $3\frac{1}{4}$ miles long

at Auburn, with a ditch on the bank to guide the low water flow around the reservoir to any rights below will obviate all riparian troubles. There are abundant reservoir sites on the higher altitudes in a region of small lakes extending at intervals from the western side of the first overland railroad eastward along the foothills of the Sierras a distance of 70 miles to the 120 degree of longitude.

The Big Rubicon and the Little Rubicon Rivers run along the foot of the lofty Sierras and pour their cold waters into the American. Two and a half miles above Auburn the main American River passes under a wire suspension bridge 260 feet long from one stone abutment to the other. The floor of the bridge being 50 feet above the lowest stage of the River, here the amount of water running can be easily measured. In the winter the water rises in the River to within 7 feet of the floor of the bridge. This makes a swift running stream 43 feet deep and 260 feet wide. In the wet season enough water passes under this bridge every 48 hours to supply San Francisco a whole year.

A large reservoir site 10 miles long and about a mile wide, not generally known, exists on a branch of the Main River near Mt. Gregory.

A person need not necessarily be an engineer to pass judgment upon the requisites of a good water supply. A practical man who has harnessed water powers, utilized their flow to drive machinery year in and year out, makes the best witness in testifying as to the flow and capacity of a mill stream.

A person, although an engineer, whose chief occupation is to measure the width and grade of streets, is totally unfit to be trusted in the selection and construction of the works of a city water supply. The taxpayers have no use for high priced impractical men. San Francisco has already expended \$300,000.00 since 1875 in examining proposed water supplies, and yet the City has not advanced a single step towards acquiring the desired object during the past 30 years. A practical mill man, seeking a power plant, would have comprehended the merits of the situations almost at a glance. The Cities must have new and superior systems.

No part of the Spring Valley, or the People's Water Co. of Oakland, excepting the reservoir sites and the street service pipes in the Cities, are worth buying: these may be worth \$3,000,000 in each City, although many of the pipes have been down 38 years, and those under the Bay 14 years. None of the outlying works of these companies are wanted, inasmuch as the Sierra supply contemplates an ample independent supply, superior in quantity, quality and cheapness, with an electric power plant combined having a water power force that will give 10,000 electric horse power, which is usually estimated as equal to the allied strength of 100,000 men. When this force is increased (as it may be) to 30,000 horse power, not all the strength of all the able bodied men of the State can resist it.

THICKNESS OF IRON PIPES

The thickest wrought iron pipes in the Spring Valley system are 3-16 of an inch. I have planned that each of the two 4-foot pipes, in my system, a distance of 15 miles from Auburn to Roseville, be made of No. 12 iron (or steel); from Roseville to San Francisco, a distance of 100 miles, the two pipes need not be more than 2 feet in diameter, because they will stand under a fall of about 1000 feet with pipes 4-16 of an inch thick. This is one-third thicker than any known wrought iron city water supply pipes under equal conditions.

To the Honorable Mayor and Board of Supervisors of the City and County of San Francisco:

GENTLEMEN: Pursuant to the Resolution of said Board, No. 7120, and public convenience and necessity, your petitioner offers to said City and County an immediate and adequate municipal supply of pure, fresh water, the sources of which he controls, and he is willing to transfer to the City at the prices hereinafter mentioned, which supply is adequate to the City's needs and purposes, and is capable of furnishing to the City an immediate daily supply of not less than 60,000,000 gallons of water per day at less expense than any other system heretofore suggested.

I hereby give an absolute guarantee of a future possible development of my plant of not less than 2,000,000,000 gallons per day as the population of the City shall increase.

I herewith submit a statement of the property which I have suitable for supplying San Francisco with water, electric light and power, all from the same source, together with the probable cost of the construction works. Just below the junction of the North and Middle Forks of the American River in Placer and El Dorado Counties, in Sections 11, 12 and 14, Township 12 N, Range 8 E., M. D. B. and M., and within one mile of Auburn Railroad Station, I own 820 acres of land, mostly secured by United States Land Patents, situated on both sides of said River. Across this land said River carries not less than 10,000 miner's inches of water in the driest weather, constantly running day and night. In the wet season the River is a roaring stream 40 feet deep and 260 feet wide, at an elevation of 1100 feet above the level of the sea.

The catchment basin of said Two Forks, the Middle Fork being the larger stream, is 1500 square miles at an altitude of from 1100 feet to 8500 feet above sea level. The fall of the River is 60 feet per mile at Auburn. Roads have been constructed paralleling the River to utilize the same. The stream includes the Big Rubicon and the Little Rubicon Rivers with a dozen or more small lakes, all of which are fed by melting snows of equal quality to Lake Tahoe. Billions of gallons of the purest water can be stored in these lakes for summer use.

In addition to these there are several places along the Forks where reservoirs can be easily constructed by using the River beds, thus forming lakes miles in extent.

The River bed and mountain sides are mostly one continuous rock, forming the best foundations for dams and conducting water. No swamps exist, but sandy beaches barren of vegetation are found all along the route a distance of 70 miles.

The surrounding country is such that the water is not likely to be polluted in the future by decaying animal or veg-

etable matter. Population, mining and ranching are all declining in Placer and El Dorado Counties, as the census statistics show.

It is proposed that two steel water pipes each 48 inches in diameter be made of No. 12 steel, sufficient to carry 60,000,000 gallons of water daily from the River to the City without pumping. Gravitation is enough.

COST OF WATER WORKS

Two steel water pipes, each 48 inches in diameter, each 118 miles in length, weight 53 pounds per surface foot of 12 feet No. 12 steel sheets. Pipes to be made from steel sheets 60 inches by 144 inches. Price 2½ cents per pound. Add for pipe sleeves, 6 inches wide, one-fifth of 118 miles.....	\$1,816,162
Making and laying pipes in a trench, using trench machine, 118 miles, \$2.90 per lineal foot, with electric power.....	1,806,816
820 acres of land near Auburn, with 4000 feet of water pipes, derricks, cables, construction, tools and buildings.....	300,000
Right of way for pipes, 230 acres, \$200 per acre.....	46,000
Reservoir dam across American River, 300 feet long, 200 feet high	300,000
Reservoir dam across North Fork.....	10,000
Reservoir dam at Rockbound Lake.....	10,000
Reservoir dam at Lee Lake.....	10,000
Reservoir dam at American Valley.....	30,000
Reservoir dam at French Meadows.....	30,000
Contingent expenses	50,000
Total.....	\$4,408,978
No tunnels or bridges required.	

COST OF ELECTRIC WORKS

for power and light. Auburn to San Francisco 118 miles. 10,000 horse power to be developed and delivered at San Francisco via Oakland from the water power of the American River near Auburn.

Wires—4 copper wires weighing one-third of a pound per foot each, 830,720 pounds at 20 cents per pound, aggregating	\$166,144
4720 poles at \$4 each.....	18,880
Setting poles with wires	8,000
Two dynamos and two 96 inch turbine wheels set ready for use in steel penstocks with power house	150,000
Contingent expenses.....	50,000
 Total.....	 <u>\$393,024</u>

RECAPITULATION

Total expense for the two utilities:

Water	\$4,408,978
Electricity.....	393,024
	<u>\$4,802,002</u>

By using the free electric power on the place, the entire work may be completed in eighteen months.

Cost of supplying 200,000,000 gallons of water to the City from the same ultimate source, including therein the former 60,000,000 gallon supply to be continued in use at the former estimated cost:

Two steel pipes, each 60 inches (5 feet) in diameter, No. 12 steel laid in a trench parallel to the former described two 4-foot pipes (allowed to remain) and of similar construction, 2½ cents per pound, steel pipes weighing 66 pounds per linear foot.....	\$2,261,635
Making and laying two pipes in a trench, using trench machine with electric power, 118 miles at \$3.50 per linear foot.....	2,170,640

Raising dam an additional 20 feet in the Main River near Auburn.....	50,000
Reservoir dam at Five Lakes Creek.....	30,000
Reservoir dam at Swan Lake.....	30,000
Contingent expenses.....	50,000
Cost of 2000 acres of Government land to be over-flowed at Swan Lake and Five Lakes Creek at \$2.50 per acre.....	5,000
Total	<u>\$4,607,295</u>

REMARKS

For a full description of the lakes mentioned herein, also a pipe line system to the City, see Municipal Reports for the year 1893-4 of said City, pages 173 to 179 of Appendix, D. B. Merry, C. E.

Although this plan provides for two 4-foot steel water pipes one-eighth of an inch thickness of steel, yet two pipes 2 feet in diameter one fourth of an inch thickness of steel the most of the distance will be sufficient, inasmuch as water in falling reduces itself one-half every sixteen feet in falling; hence the two 2-foot pipes under a fall, in conducting water, of 48 feet are equivalent to the two 4-foot pipes under a fall of 4 inches, where the water barely moves. Therefore, excepting about 18 miles from Auburn to Roseville, where the fall is 60 feet per mile, the two 2-foot pipes are sufficient to carry 60,000,000 gallons of the best mountain water to the City daily, at a considerable less expense than I have estimated for the larger pipes the whole distance. The reservoir lake created by damming the River at Auburn will hold ten billion gallons, lasting the City four hundred days.

The ditch on the River bank will be used for electric power purposes and also give the low water flow to the vested rights on the River below, thus injuring no one on the River either above or below.

So long as every riparian owner has all the flowing water he can use, he is not damaged by a surplus portion being turned out above him from the same stream and diverted elsewhere.

The sale of the 10,000 electric horse power, if not wanted by the City, will give the City an income of half a million dollars annually, and be more than sufficient to pay the interest of the 4 per cent bonds that the City may issue for the cost of the work, create a sinking fund and eventually give the city *free water and free light*.

According to all the estimates herewith I shall be willing (if permitted) to construct the entire plant and guarantee its merits.

WHEREFORE your petitioner prays that you will consider and act upon the above named project.

Respectfully submitted,

JAY E. RUSSELL.

SAN FRANCISCO, November , 1907.

APPENDIX

American River compared with Tuolumne, (Hetch Hetchy) River.

The American River according to the U. S. Geological surveys has a catchment basin of the North and Middle Forks above Auburn of 1500 square miles. The average annual rainfall at Auburn is 46 inches, gradually increasing at Georgetown to 59 18 inches in the last twelve years' observation to 100 inches at the Sierra Summit, making an average 73-inch rainfall over the whole area, Combining the proposed city supplies of Dunn, Muir, Henderson and the power plant of the S. P. R. R. Co., all above and on the same stream. While conceding to the Irrigation Co. and the Folsom Power Co. below 1640 feet (Mr. Gurnsky's estimate), the average flow of the river at Auburn at its lowest stage is 4500 second feet, leaving 2860 second feet that may be taken out of the river anywhere above for municipal purposes of any of the Bay Cities. 20,000 H. P. can be obtained for compressed air purposes by using the water fall. The electric power plant at the same place will give from 10,000 to 30,000 electric horsepower, thus furnishing an annual income of \$500,000. Distance from the city 118 miles. No pumping, no tunneling. Cost of the works for all purposes \$4,802,000.

The following article was published in the Oakland Tribune, May 3, 1908:

"With the revival of the Hetch Hetchy scheme in connection with the proposed furnishing of San Francisco with a Sierra water supply come several questions the solving of which will be of interest to both those promoting the political side of the question and those who are sincere in their efforts to have the city acquire a sufficient supply of good water for domestic and municipal purposes. The revenue provisions of the City Charter were framed with a special care to protect the property owner and taxpayer. Among these provisions is one that the revenues of the city may only be expended on public utilities as are owned by or vested in the city. I am informed that the act of Congress setting aside the Yosemite as a public park for the people prohibits its sale or diversion for any other purpose and that privileges within its borders may be only granted subject to revocation at the will of the Department of the Interior. Among the questions that consequently arise out of the present situation are the following: 'How is San Francisco to expend money on construction of ditches, dams, restraining walls, reservoirs, etc., in connection with properties to which it has no legal title and can never expect to secure such title?' 'Will the people of this city vote to amend the charter so that they may expend upwards of \$50,000,000 in the development of water properties to which they hold no title and of which they never can expect to secure ownership?'

"Still another point of live interest to the citizens of San Francisco is that of the amount of water that will be left for the use of San Francisco after the Modesto and Turlock irrigation districts have been supplied the 2,500 cubic feet a second guaranteed them. During the past twelve 'rainfall years,' from September 1 to August 31, there have been five years in which the average flow of the Tuolumne was less than 2,500 second feet and consequently not sufficient to supply the irrigationists with the quantity of water they desired. In 1897-'98 the mean average was 1,386 second feet and in 1898-'99 the mean average was 1876 second feet. There were, of course, years in which the flow was much greater than this, but in seeking a permanent supply of water a city naturally desires one which at its minimum would be sufficient to meet requirements. These averages are taken at La Grange, where the water for the irrigationists is diverted and represents the product of a watershed of 1,501 square miles. The point where it is proposed to divert the water for San Francisco is over 40 miles further up the river and there the product of a much smaller watershed only, is available. Some engineers place the area of this latter watershed at about 500 square miles.

"As indicating the possibilities of a small flow of the Tuolumne for any year, it fell below 2,500 second feet from July to December, 1905. In September of that year the mean average was but 78 second feet, in October 46 second feet, November 62 second feet, December 129 second feet."

Thus it appears that the Hetch Hetchy Creek is during half the year a mere brook; that a person can step across it at a single leap.

The Tuolumne River, according to Engineer Gurnsky's figures as they appear in the San Francisco Municipal Reports, has a catchment basin above the intake of 452 square miles. The average annual rainfall is 36 inches. The distance by the route to be taken to the city is 186 miles. No electric power obtainable for the cities. No available income from any source. All the water for the cities must be pumped across the Altmont Pass, 585 feet elevation. Cost of the work, not including the dam at Lake Eleanor and payment to the land owners of \$1,300,000, is \$39,531,000.

This appendix is written in the hope that it may serve in some manner to save the cities from an unnecessary costly and permanently extravagant water system which will be within the means of the people to construct and which will meet with their approval. The \$5,200,000 already voted by the city for a salt water fire supply, if properly used, is enough for fire and domestic purposes.

The system proposed by Mr. Manson will not and should not meet with the necessary two-thirds vote of the electors of the city.

June, 1908.

J. E. RUSSELL.



